

WHAT IS CLAIMED IS:

- 1 1. A method of forming an edge seal along a periphery of an integrated circuit
2 device to provide increased corrosion and oxidation resistance to metallization of
3 the integrated circuit device, the method comprising the steps of:
 - 4 a. providing a semiconductor substrate having a metallic feature therein;
 - 5 b. depositing a layer of dielectric material over the semiconductor substrate and
6 metallic feature, the layer of dielectric material comprising a low-k dielectric material;
 - 7 c. selectively removing a portion of the layer of dielectric material to form a cavity
8 and expose a portion of the metallic feature;
 - 9 d. conformally depositing a layer of an insulation material in the cavity and over the
10 layer of dielectric material, wherein the insulation material and dielectric material are
11 different materials;
 - 12 e. removing horizontal portions of the layer of insulation material so as to expose
13 at least the metallic feature in the cavity;

- 14 f. depositing a barrier metal on the layer of insulation material in the cavity and on
15 the exposed metallic feature;
- 16 g. depositing a high conductivity metal in the cavity to fill the cavity; and
- 17 h. planarizing the semiconductor substrate down to the layer of dielectric material.

1 2. The method of claim 1 wherein the low-k dielectric material comprises SiLK or
2 fluoridized polyimide.

1 3. The method of claim 1 wherein the layer of dielectric material comprises a bottom
2 layer on the semiconductor substrate, the low-k dielectric material on the bottom
3 layer and a top moisture barrier on the low-k dielectric material.

1 4. The method of claim 1 wherein the insulation material is selected from the group
2 consisting of SiO_2 , SiC, Si_3N_4 , Al_2O_3 , diamond like carbon, polyimide and
3 combinations thereof.

1 5. The method of claim 1 wherein the barrier layer is selected from the group
2 consisting of tantalum, tantalum nitride, chromium/ chromium oxide, titanium,
3 titanium nitride, tungsten silicide and combinations thereof.

1 6. The method of claim 1 wherein the high conductivity metal is copper.

1 7. The method of claim 1 wherein the thickness of the insulation material in the
2 cavity is 0.05 microns to 0.5 microns.

1 8. The method of claim 1 wherein the cavity comprises at least two contiguous
2 cavities which form a damascene structure.

1 9. An edge seal around the periphery of an integrated circuit device comprising:

2 a. a semiconductor substrate;

3 b. a layer of dielectric material over the semiconductor substrate, the layer of
4 dielectric material comprising a low-k dielectric material;

5 c. a metallic wall of a high conductivity metal in the layer of dielectric material; and

6 d. a layer of insulation material between the metallic wall and the dielectric material,

7 wherein the insulation material and dielectric material are different materials.

1 10. The edge seal of claim 9 wherein the low-k dielectric material comprises SiLK
2 or fluoridized polyimide.

1 11. The edge seal of claim 9 wherein the layer of dielectric material comprises a
2 bottom layer on the semiconductor substrate, the low-k dielectric material on the
3 bottom layer and a top moisture barrier on the low-k dielectric material.

1 12. The edge seal of claim 9 wherein the insulation material is selected from the
2 group consisting of SiO_2 , SiC, Si_3N_4 , Al_2O_3 , diamond like carbon, polyimide and
3 combinations thereof.

1 13. The edge seal of claim 9 further comprising a barrier layer between the metallic
2 wall and the insulation material wherein the barrier layer is selected from the group

3 consisting of tantalum, tantalum nitride, chromium/ chromium oxide, titanium,
4 titanium nitride, tungsten silicide and combinations thereof.

1 14. The edge seal of claim 9 wherein the high conductivity metal is copper.

1 15. The edge seal of claim 9 wherein the thickness of the insulation material is 0.05
2 microns to 0.5 microns.

1 16. The edge seal of claim 9 wherein there are two metallic walls in the at least one
2 layer of dielectric material and there is a layer of insulation material between the
3 dielectric material and each of the metallic walls with each layer of insulation
4 material being of a different material than the dielectric material.

1 17. A method of forming an edge seal along a periphery of an integrated circuit
2 device to provide increased corrosion and oxidation resistance to metallization of
3 the integrated circuit device, the method comprising the steps of:

4 a. providing a semiconductor substrate having a metallic feature therein;

- 5 b. depositing a layer of dielectric material over the semiconductor substrate and
6 metallic feature, the layer of dielectric material comprising a low-k dielectric material;
- 7 c. selectively removing a portion of the layer of dielectric material to form two first
8 cavities and expose a portion of the metallic feature;
- 9 d. depositing an insulation material to fill the two first cavities, wherein the insulation
10 material and dielectric material are different materials;
- 11 e. selectively removing a portion of the layer of dielectric material, and any overlying
12 insulation material to form a second cavity;
- 13 f. depositing a barrier metal in the second cavity and on the exposed metallic
14 feature;
- 15 g. depositing a high conductivity metal in the second cavity to fill the cavity; and
- 16 h. planarizing the semiconductor substrate down to the layer of dielectric material.

1 18. An edge seal around the periphery of an integrated circuit device comprising:

- 2 a. a semiconductor substrate;
- 3 b. a layer of dielectric material over the semiconductor substrate, the layer of
- 4 dielectric material comprising a low-k dielectric material;
- 5 c. a metallic wall in the layer of dielectric material; and
- 6 d. a wall of insulation material between the metallic wall and the periphery of the
- 7 integrated circuit device wherein the insulation material and dielectric material are
- 8 different materials.